WHAT IS CLAIMED IS:

1. A noise reduction method for dividing input noise speech into a plurality of continuous frames, determining noisy speech spectrum for each frame, and partitioning frequency band into multiple sub-bands to determine clean speech spectrum from the noisy speech spectrum on each sub-band, the method comprising:

(A) estimating noise spectrum $|W_r(k)|^2$ of r-th frame at k-th frequency component from the noisy speech $y_r(k)$ of r-th frame by silence detection and noise spectrum estimation;

(B) estimating signal-to-noise ratio (SNR) value $SNR_r(i)$ of i-th sub-band for r-th frame;

(C) determining an over-subtraction factor $\alpha_r(i)$ of sub-band i based on the estimated $SNR_r(i)$; and

(D) determining clean speech spectrum estimate by performing, on each sub-band, a spectral subtraction:

$$|\hat{S}_r(i,k)|^2 = |Y_r(i,k)|^2 - \alpha_r(i) \cdot |W_r(i,k)|^2,$$

where $|\mathbf{Y}_r(i,k)|^2$ is noisy speech spectrum of the r-th frame at the k-the frequency component of the i-th sub-band, $|W_r(i,k)|^2$ is corresponding noise spectrum, and $|\hat{S}_r(i,k)|^2$ is clean speech spectrum at sub-band i for the r-th frame.

2. The noise reduction method as claimed in claim 1, wherein in step (C), the over-subtraction factor of the i-th sub-band for the r-th frame is:

$$\alpha_r(i) = \alpha_0(i) + SNR_r(i) \cdot \frac{1-\alpha_0(i)}{SNR_1(i)},$$

where $\alpha_0(i)$ is pre-selected over-subtraction factor when the actual $SNR_r(i)=0$ at sub-band i, $SNR_1(i)$ represents pre-selected SNR value when $\alpha_r(i)=1$, and $SNR_r(i)$ is SNR estimate of the i-th sub-band for the r-th frame.

3. The noise reduction method as claimed in claim 2, wherein, the over-subtraction factor $\alpha_r(i)$ of the sub-band is modified by the SNR value SNR_r of the frame as:

$$\alpha_r(i) = \alpha_{max} \quad \text{if} \quad SNR_r < SNR_{min},$$

where SNR_{min} is a pre-selected minimum value of SNR.

4. The noise reduction method as claimed in claim 2, wherein the $SNR_r(i)$ is obtained by a regression process:

$$SNR_r(i) = \mu \cdot SNR^o_{r-1}(i) + (1-\mu) \cdot 10 \cdot \log_{10}\left(\frac{\sum\limits_{k \in \text{sub-band } i} |Y_r(i,k)|^2}{\sum\limits_{k \in \text{sub-band } i} |W_r(i,k)|^2} - 1 \right),$$

where $0 < \mu < 1$, and $SNR^o_{r-1}(i)$ is the SNR of the sub-band i for the previous frame after noise reduction.

5. The noise reduction method as claimed in claim 4, wherein $SNR^o_{r-1}(i)$ is determined by:

$$SNR^o_{r-1}(i) = 10 \cdot \log_{10} \frac{\sum\limits_{k \in \text{sub-band } i} |\hat{S}_{r-1}(i,k)|^2}{\sum\limits_{k \in \text{sub-band } i} |W_{r-1}(i,k)|^2}.$$

6. The noise reduction method as claimed in claim 2, wherein the $SNR_r(i)$ is obtained by a high order statistic method.

7. The noise reduction method as claimed in claim 1, wherein the noisy

speech is processed by fast Fourier transform to obtain the noisy speech spectrum.

8. The noise reduction method as claimed in claim 1, wherein the noisy speech is processed by silence detection and noise spectrum estimation to estimate the noise spectrum.

9. The noise reduction method as claimed in claim 1, wherein in step (D), the determined clean speech spectrum estimate is processed by inverse fast Fourier transform to obtain corresponding enhanced speech signal.